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Structural Modifications of Lanthanum Orthoferrite Ion Transport Membranes by Divalent Ion Substitutions

Monday, August 13, 2012
1:30 - 2:30 PM
Materials Science Laboratory, TA-03-1698, Room A103, MSL Auditorium

Abstract: This research looks at the stability of specific LaxA1-xFeO3-y , perovskite-type, materials that are candidate for use in future commercial gas separation processes including Syngas (CO-H2) production. These materials would be expected to survive for long times under highly reducing as well as oxidizing conditions to temperatures approaching 1000°C. Using a combination of x-ray and neutron diffraction, dilatometry, electron microscopy, magnetometry, TGA, DSC, and DTA, the phase relations and stability of LaxA1-xFeO3-y were assessed, with emphasis on understanding the behavior of LaxA1-xFeO3-y and certain derivatives. Several interesting phase transformations were observed including a ferro- to paramagnetic phase transformation near 400°C and an orthorhombic to rhombohedral transformation near 900°C. Reitfeld refinement and neutron diffraction were used to assess atomic positions of atoms and vacancies in order to characterize the mechanisms of the phase transformations.

Biography: Darryl P. Butt is a Professor and Chair of Materials Science and Engineering at Boise State University, and an Associate Director of the Center for Advanced Energy Studies (CAES) in Idaho Falls, ID.

Dr. Butt was at Los Alamos National Laboratory between 1991 and 1999, where he was a Director's Post Doctoral Fellow, Technical Staff Member, Team Leader, and Lead Project Leader. His research at LANL included modeling and developing materials for extreme environments, environmental effects on materials, surface analysis, carbon dioxide sequestration, and non-proliferation. From 1998-2000, on leave from LANL, Dr. Butt lead an DOE-Industry program at Ceramatec, Inc., in collaboration with Air Products and Chemicals Co. to develop microchannel gas separation membranes for the production syngas from natural gas. From 2000-2005 he was an Associate Professor at University of Florida in the Department of Materials Science and Engineering. He joined Boise State University in 2005.

Dr. Butt has approximately 180 publications in journals such as J. Am. Ceram. Soc., J. Mater. Res., J. Mater. Sci., J. Electrochem. Soc., J. Nucl. Mater., Met. Trans. A, J. Nucl. Mater., Acta. Mater., J. Non-Crystalline Solids, J. Appl. Phys., J. Physical Chem. B, Physica C, J. Mater. Sci. Lett., Mater. Sci. Forum, Phil. Mag., Oxid. Metals, CALPHAD, Electrochemica Acta., Corrosion, Corrosion Science, Scripta Mater., Surface and Interface Analysis, Fatigue and Fracture Mech., J. of Test. and Eval., World Resource Review, Greenhouse Gas Control Technology, Energy Convers. Mgmt., and Energy (Oxford).

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